

**MANAGING OIL DISRUPTIONS:
ISSUES AND POLICY OPTIONS**

**The Congress of the United States
Congressional Budget Office**

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PREFACE

On September 30, 1981, the Emergency Petroleum Allocation Act of 1973, with its authority for coupon rationing of gasoline, expires. The Congress will, therefore, have to decide whether to extend the President's authority to institute coupon rationing in the event of an oil shortfall, to expand the list of alternative policies, or to allow the authority to lapse.

The Congressional Budget Office (CBO) has prepared this analysis of options to mitigate the negative effects of an oil disruption in response to a 1980 request by Senator Henry Jackson, then Chairman of the Senate Committee on Energy and Natural Resources. In keeping with CBO's mandate to provide objective analysis, this report makes no recommendations.

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SUMMARY

The vulnerability of U.S. oil imports to supply disruptions was demonstrated twice in the last decade, once by the 1973-1974 Arab oil embargo and again by the 1979 Iranian revolution. In response to the first, the Congress passed the Emergency Petroleum Allocation Act of 1973 (EPAA) and the Energy Policy and Conservation Act of 1975 (EPCA). Both acts mandated the establishment of a standby rationing plan to allocate gasoline during a shortfall, but no detailed plan is yet in place. Authority for this rationing plan will expire on September 30, 1981, and its renewal or replacement by other policies is an open issue before the Congress.

This report describes the policy alternatives that the Congress may wish to consider in reviewing standby authorities to deal with oil import disruptions. Its central theme is that large disruptions of imported oil can deal the economy a severe blow: reduced output, increased unemployment, and higher inflation. Alternative policies might allow this blow to be offset in different ways, but they cannot eliminate it. Some policies better contain the inflationary effects of a disruption but are less effective in mitigating losses in aggregate production and higher unemployment. For others, the converse is true. Further, the appropriateness of each policy varies with the size and anticipated duration of the import disruption. Thus the Congress may wish to consider a portfolio of standby policies as well as the selection of just one.

OIL DISRUPTIONS AND THEIR ECONOMIC CONSEQUENCES

The economic losses that would follow a disruption in the flow of imported oil have two sources: reduction in aggregate supply, and reduction in aggregate demand. With regard to the first, manufacturers and other oil users are forced to curtail their activities if less oil is physically available. Unless this energy source can be replaced, perhaps by oil from a Strategic Petroleum Reserve, no government policy can mitigate the loss. This reduction is exacerbated by its uneven nature. Some sectors will lose more than others, causing bottlenecks and inefficiencies that hamper efficient use of the energy that is available.

The reduction in aggregate demand is the result of the sudden redistribution of income that follows the large price increases inevitably

accompanying an oil shortfall. Large amounts of income flow from oil users to oil producers in the United States and overseas. As real income falls, consumers reduce their purchases of other goods and services. At the receiving end of the income flow, oil producers (both domestic and foreign) may not spend or invest their increased income fast enough, or in ways most constructive to the economy. Thus, aggregate demand will decrease as a consequence of the income redistribution. This is usually termed "oil price drag."

There are two principal tools that the United States could develop in advance to mitigate the effects of an oil import disruption. The first is a Strategic Petroleum Reserve and the contingency plans necessary for its use. This is widely recognized as the most practical way to reduce the physical shortfall resulting from the import disruption. Little more need be said about it here. 1/

The second is the set of demand-related policies, of which the standby authorities under EPAA are one example. The questions raised by the expiration of EPAA are whether the nation should adopt any special policies to deal with the demand-related consequences of an oil import disruption, and, if so, what they should be.

POLICY OPTIONS

There are three strategic approaches to the demand-related economic losses that would follow an import disruption. The first is for the government to do nothing beyond intelligent execution of the policies and programs now in place. This "neutral" policy would allocate the scarce supplies of oil by permitting prices to rise. The windfall profits taxes now in effect would be collected and, with new legislative authority, quickly disbursed to consumers in some equitable way. Beyond this there would be no attempt to capture and recycle the windfall revenues flowing to foreign and domestic oil producers.

The second approach would also use rising prices to allocate oil supplies. But in addition, it would employ taxes as a deliberate instrument of policy to retain in the economy some of the windfall revenues that would otherwise flow to foreign and domestic oil producers. To the extent that

1/ A detailed discussion appears in: Congressional Budget Office, An Evaluation of the Strategic Petroleum Reserve, a report prepared for the House Subcommittee on Energy and Power (June 1980).

these tax revenues could be efficiently and fairly redistributed to consumers, much of the demand-related problem, the oil price drag, could be mitigated. Prototypical tax policies would include:

- o Import tariffs, imposed either unilaterally or in consonance with other oil-importing nations, which would retain for redistribution a portion of the windfall revenue that would otherwise flow to foreign oil producers;
- o Oil refining fees, which would seek to retain the windfall revenue accruing to domestic as well as foreign oil producers;
- o End-use taxes, such as a gasoline tax, which would concentrate the effect of the disruption on final demand, thereby mitigating the inflationary effects of a disruption.

The third general strategy, coupon rationing, is derived from the approach taken by the expiring Emergency Petroleum Allocation Act. Under this option, domestic prices would be controlled and certain petroleum products (gasoline, for example) would be allocated through the distribution of ration coupons. Allocation of crude oil among refiners, a special topic treated in depth in Appendix B, would also have to be considered if this approach was adopted.

REVIEW OF POLICY OPTIONS

Each of these policy options was reviewed with three considerations in mind:

- o How the policy would change the economic consequences of an oil disruption in terms of GNP loss, unemployment, and inflation;
- o How the policy would offset the sudden redistribution of income that would accompany an import disruption; and
- o How difficult the policy would be to administer competently.

Neutral Policy

Policy Overview. The first option is based largely on the emergency authorities that would remain after the expiration of EPAA. It follows a neutral course, allowing the market to price and allocate petroleum products. The windfall profits, corporate income, and state and local taxes

now in place would collect much of the extraordinary revenue transferred by the shortage, thus ameliorating the sizable income transfers within U.S. borders. The government would quickly disburse its additional revenues in a manner that would stabilize the economy. While there would necessarily be some time lag between collection and disbursement, reducing this lag would be a key administrative goal. In addition, government expenditures for such automatic stabilizers as unemployment insurance or food stamps would increase.

Major Advantages. The major advantages of a neutral policy would be the efficient allocation of petroleum products and its administrative simplicity. Price increases would allocate products and eliminate gasoline lines by reducing demand. Income transfer programs would go into effect automatically. With the exception of an emergency mechanism to rebate quickly the increase in federal revenues from the existing windfall profits tax, the means to carry out this policy are already in place.

Major Disadvantages. Although there is a windfall profits tax on domestic producers, a neutral policy would have no provision for collecting any of the revenues that would flow to foreign oil producers. In addition, there is no existing authority to rebate quickly windfall profits tax revenues, which would be very sizable if a large shortfall developed.

Appropriate Situations. The neutral policy would be a quick and efficient response to smaller disruptions, perhaps a million barrels per day or less. But as the size of the disruption increased, the oil price drag would become more significant and the existing transfer programs might be less able to counteract the negative effects of the income redistribution.

Oil Tax or Tariff

Policy Overview. The purpose of a tax policy is to capture for recycling within the economy more of the windfall revenues flowing to producers than would be the case in the neutral policy. Although each tax has particular advantages and weaknesses, in general they all work in the same way. Each tax would be applied during, or even slightly before, the disruption to raise the price of oil products above the levels that they would otherwise reach. If all major importing nations took this action in concert, the consequent reduction in oil demand could mitigate the rise in market prices while the tax would retain a portion of the windfall revenue for the consuming nations. The funds collected by the tax would be rebated quickly, possibly through the income tax system, to mitigate the oil price drag. If the United States was to take such action alone, the tax policies would be

reduced in effectiveness, because this country would bear the entire burden but all consuming nations would benefit.

There are many variations of oil taxes that could be developed, but most can be subsumed into import tariffs, crude oil refining fees, and gasoline taxes. Each has special advantages and disadvantages.

Major Advantages. The principal advantage of an import tariff is that it would reduce the outflow of income to foreign oil producers. Although this advantage would be blunted to the extent that other oil-consuming nations did not participate, even a unilateral tariff might have some benefit. If the revenues captured by the government were recycled quickly into the economy, some of the income loss would be eliminated. The tax or tariff would still allow the market to allocate petroleum products. It could be imposed easily, without a major new administrative system.

A crude oil refining fee would have the advantages of other taxes, but, in addition, it would collect more of the extraordinary revenues accruing to domestic producers than the windfall profits tax alone. While the difference might not be significant at lower levels of disruption, as the shortfall increased and the windfall grew, the portion missed by the windfall profits tax might become quite sizable.

By contrast, a gasoline tax would concentrate the major impact of the disruption in a sector of final demand in which some consumption is viewed as discretionary. This concentration might also slow the spread of the inflationary effects of the tax through the economy, whereas a tax levied on intermediate oil uses would be incorporated immediately into the price of all goods and services that use oil in their production. This would be quite important if the disruption was likely to be temporary, since it would help prevent domestic prices from remaining at high levels after the disruption ended. In addition, a gasoline tax might have fewer recessionary effects than a tax on oil used in production, and might be perceived as more equitable than a tax on other products, such as home heating oil.

Major Disadvantages. If imposed unilaterally, any oil tax would make oil in the United States more expensive, while making world oil less expensive and more plentiful. This would happen because the tax would increase the price of oil in the United States beyond what the market would have imposed in order to reduce demand. To the extent that the United States used less oil than it otherwise would have, more would be available for foreign consumers, thus reducing their costs. In effect, the United States would subsidize foreign oil purchases. Multilateral action would alleviate this problem since consumer nations would be setting similar prices and further reducing demand.

Because oil has few close substitutes and is so crucial to consumers, any tax would have to be sizable in order to reduce demand significantly. The size of an effective tax would create significant administrative difficulties. If the shortfall were over a million barrels per day, the amount of revenue collected could conceivably exceed \$100 billion per year. Rebating this enormous amount through the tax system could be difficult. Even in relatively small disruptions, the rebate would equal federal income taxes in many households. Thus, the government, in effect, would substitute an excise tax for much of the income tax. Since the income tax system was built over a number of years with a great deal of attention to economic and equity effects, replacing it suddenly with another system might not be desirable.

Setting the tax correctly would require detailed information about prices, oil stocks, and consumer demand response. Since it is impossible to obtain precise information of this sort, the tax policy must either include a mechanism for correction or accept the diminished effectiveness resulting from collecting too much or too little.

In addition to these general disadvantages, the individual tax proposals have unique problems. For instance, because the crude oil refining fee would apply to domestic crude, the marginal incentive to produce more oil would be lost. Although the additional production might not be significant in the short run, for longer disruptions, perhaps lasting a year, these incentives could be important.

A gasoline tax, unlike crude oil taxes or tariffs, would distort the allocation of petroleum among products. It would not provide as many incentives for conservation by users of other petroleum products as would a more encompassing tax. Thus some of the demand reduction in the response to higher prices would be lost. Finally, the usefulness of a gasoline tax would diminish as the size of the disruption passed 2 million barrels per day because of inherent limitations on refinery flexibility and the extraordinary impact on one end-use market.

Appropriate Situations. The ability of the tariff to capture the flow of revenue to foreign producers might be viewed as a threat by producer nations. If producer nations should retaliate, the tariff could be counterproductive. Independent of the response of oil producers, a multilaterally imposed tariff would offer the best prospect for capturing the shortfall premium. The problems involved in redistributing these revenues, however, would limit the usefulness of taxes at disruption levels much above 2 million barrels per day.

Coupon Rationing

Policy Overview. If the price of domestic oil was to be controlled during an import disruption, a rationing system would be needed to allocate the scarce supplies. Typically, gasoline is the product rationed in most such plans. Consumption would be allocated by the distribution of coupons. These coupons would be freely negotiable, and persons with extra coupons could probably sell them at a profit. Because of price controls, U.S. consumers would pay the weighted average of the world oil price and the controlled domestic price. The price of gasoline would remain stable, while the market price of coupons would rise. In this way, some of the revenue that would otherwise be transferred to producers would remain in the hands of consumers as a group.

Major Advantages. Rationing might reduce the GNP loss from a very large shortfall by allowing consumers to keep some of the income that otherwise would be transferred to producers. Also, the existence of a white market for coupons would allow the transfer of income and gasoline among consumers, thereby helping the economy to adjust. Moreover, rationing might promote public perception that the burden of reduced supplies was being fairly shared, which, at very large levels of shortfall, would be important in promoting social cohesion.

Major Disadvantages. For a small disruption, the allocations and price controls inherent in rationing would create an inefficient distribution of petroleum products and thus might exacerbate the economic damage. Rationing would also require a large bureaucracy to prepare the program and carry it out, and might easily be undermined by mistakes; public faith in rationing could erode quickly if motorists with coupons approached gasoline stations only to find no gasoline available. Finally, domestic wellhead price controls would create the same disincentives to increased production as the crude oil refining fee discussed earlier.

Appropriate Situations. Rationing's advantages--preserving social cohesion and perceptions of equity--could become increasingly important with larger shortfalls. The lack of production incentives, however, would make strict price controls less appropriate as the duration of the disruption lengthened.

THE USE OF CONTINGENCY POLICIES

The comparative advantages of these various options appear to change with the magnitude of the disruption they confront. In the event of a small disruption, perhaps below 1.0 million barrels per day, the ease and efficiency

of a neutral policy would give it a natural advantage. At somewhat higher levels of disruption, around 1.0-2.0 million barrels per day, tax policies appear to be quite workable and capable of producing positive benefits. As the disruption size increased beyond 2 million barrels per day, the refunding problem would become increasingly severe. The tax-based policies, starting with gasoline taxes, would begin to be less effective. For large disruptions, coupon rationing might have distinct advantages that would outweigh its disadvantages.

Since oil disruptions affect both supply and demand, policies that address both are needed. Thus, the policies discussed above should not be regarded as a substitute for the Strategic Petroleum Reserve; nor are they temporary replacements until the reserve is filled. Rather, these contingency policies and the oil reserve are complementary. Each would be more effective in the presence of the other. For example, the combination of a tariff and the release of oil from the reserve would serve to: (1) replace, in part, the supply of oil lost; and (2) decrease the demand for oil and thus reduce the increase in oil prices. The resulting outflow of money could be less than that which would result if the policies were not applied in concert.

Finally, all of these contingency policies would be most effective when undertaken in consonance with other oil-consuming nations and when the probable reactions of the oil-producing nations were taken into account.

A QUANTITATIVE ASSESSMENT OF ALTERNATIVE POLICIES

The Data Resources, Inc. model of the U.S. economy was used to understand better the relative effects of each policy and the magnitude of the income flows. A large and a small shortfall were simulated, both lasting throughout 1982. The world markets are assumed to lose 7.5 and 3.0 million barrels per day, respectively. In response, U.S. oil imports initially decline by 2.5 and 1.0 million barrels per day, or roughly 40 percent and 15 percent of current U.S. imports, respectively. By contrast, the 1973-1974 oil embargo cost the United States an average of 1 million barrels per day for four months.

In response to the initial world loss, oil prices rise from a baseline projection of \$39 per barrel to \$86 per barrel for the large shortfall and \$57 per barrel for the small shortfall. As with the quantities, the world prices would also be affected by policy responses. In the year following the shortfall, it is assumed that supply is restored and prices fall to \$57 and \$47, respectively. These figures are net of any use of private stockpiles or the Strategic Petroleum Reserve. The price increases are consistent with short-term demand elasticities between -0.1 and -0.15. If the response of demand

to price increases was larger, the price and macroeconomic effects would be proportionately smaller.

Summary Table 1 draws together the results of the simulations. These results illustrate the nature of the policy tradeoffs. In general, reductions in GNP loss are obtained at the expense of greater inflation, although the inflationary effect diminishes considerably after the disruption has passed. While this conclusion can be stated with confidence, the results in Summary Table 1 should not be treated as forecasts of the course of the economy during the next oil shock. This is because the rapid increase in oil prices during a disruption produces income flows beyond the historical experience upon which the model draws. Nevertheless, these results are a useful illustration of the fundamental tradeoffs between GNP loss and inflation that alternative policies provide.

SUMMARY TABLE 1. ILLUSTRATIVE MACROECONOMIC EFFECTS OF
POLICY OPTIONS

Options	GNP Loss (Percent of projected GNP) <u>a/</u>	Fifth Quarter Increase in the Unemployment Rate (In percent- age points)	Fourth Quarter Increase in the Price Level (In percents) <u>b/</u>	Eighth Quarter Increase in the Price Level (In percents) <u>b/</u>
Neutral Policy				
Small shortfall	1.6	0.7	3.1	1.9
Large shortfall	4.3	1.8	7.2	5.5
Unilateral Import Tariff				
Small shortfall	1.2	0.5	6.1	2.7
Large shortfall	4.3	1.9	13.0	7.6
Multilateral Import Tariff				
Small shortfall	1.0	0.4	5.0	1.7
Large shortfall	3.0	1.2	10.9	5.0
Crude Oil Refining Fee				
Small shortfall	0.8	0.4	6.4	3.0
Large shortfall	3.5	1.6	13.8	8.6
Gasoline Tax				
Small shortfall	0.6	0.2	5.7	3.0
Large shortfall	<u>c/</u>	<u>c/</u>	<u>c/</u>	<u>c/</u>

SOURCE: Data Resources, Inc. model of the U.S. economy.

NOTE: The small shortfall is assumed to be 1 million barrels per day for the United States; the large is 2.5 million barrels per day.

a/ Average constant dollar GNP loss for first five quarters.

b/ Percent change in GNP deflator relative to the baseline of no shortfall.

c/ Not simulated.

Since the Arab oil embargo of 1973, consuming nations have recognized that Middle Eastern oil supplies are unreliable. In the intervening years, major producers in the Persian Gulf region have twice ceased production--once in 1979 and again in 1980. Recent clashes between Iran and Iraq have threatened to engulf the entire region, which would create a major worldwide oil shortfall. These events have served to reinforce the central message of the 1973 embargo: the United States can no longer count on a stable supply of imported oil.

Not only is the supply of oil unreliable, but the size of a cutoff is potentially large. The United States imports about 35 to 40 percent of its crude oil and refined petroleum products. Of this, 10 percent comes from the Persian Gulf. Europe and Japan, however, are much more dependent on oil imports from the Persian Gulf (over 70 percent in Japan's case; less, but still substantial, for European nations). If Gulf exports ceased, these nations would have to acquire their petroleum from other sources. Inevitably, they would begin bidding for oil that remained on the world oil market, forcing up world prices. Remaining foreign suppliers might also divert some oil from the United States to other customers. Thus, not only are U.S. imports large, but they are vulnerable to events outside the immediate trading sphere of the United States.

An oil disruption would first reduce the output of manufacturing and other firms that require oil products for their various processes, which in turn would reduce aggregate supply. As a shortfall caused world oil prices to rise significantly, the remaining producers, both domestic and foreign, would reap a scarcity, or shortage, premium (the additional price paid for the oil still produced). The price increases would further depress the U.S. economy as large amounts of money--the shortage premium--were transferred from domestic consumers to foreign and domestic producers, leaving consumers with less money to buy goods and services. Inflation would rise as the higher oil prices rippled through the economy, first through refined petroleum products and then through all other products dependent on petroleum inputs. Once again the U.S. economy could face lower output and higher unemployment and higher inflation simultaneously.

Three varieties of policy responses are available to ameliorate the effects of a future shortfall. The first would allow the market to allocate the remaining oil--in essence a "neutral" policy. Second, the Congress could

impose a tax or tariff to capture and redistribute the shortage premium while still allowing the market to allocate the oil. Third, a standby coupon rationing plan could be put into effect, thus substituting government for market allocation.

These approaches could all be used in conjunction with drawing on the Strategic Petroleum Reserve (SPR), but would not depend on it for their effectiveness. Since the SPR is incomplete, it is unlikely to be used in the near future in any but the largest shortfalls. Consequently, this analysis assumes that it will not be a consideration in policy deliberations. As the SPR grows in size, the decisions regarding these policies may become less crucial. Even when the SPR attains its full capacity, however, policymakers may, in response to a shortfall, want alternatives to doing nothing or drawing down the SPR.

In response to the vulnerability of U.S. oil supplies, the Congress passed the Emergency Petroleum Allocation Act of 1973 (EPAA), and later the Energy Policy and Conservation Act of 1975 (EPCA). Both acts mandated the establishment of a standby coupon rationing plan to allocate gasoline during a shortfall. After many delays, the Department of Energy submitted a plan that the Congress approved and detailed preparations for standby rationing began recently. The authority for the standby rationing plan is due to expire in September 1981, however. Furthermore, the Administration has proposed abolishing the office that administers the preplanning for the rationing program, which, in effect, would eliminate rationing as an option for the foreseeable future. Thus, the decision before the Congress is whether to allow the present authority for standby rationing to lapse, thereby relying principally on market allocation in the event of an oil disruption; whether to renew the authority for standby rationing; or whether to devise alternate policies.

This report presents options for managing oil supply interruptions, the likely circumstances in which they would be used, and their effects. Chapter II describes the economic effects of curtailments. Chapter III then discusses the principal characteristics of oil shortfalls. A description of the various policy options and an analysis of the effects of the policies on the major areas of concern--the economy, income distribution, and ease of administration--are presented in Chapter IV. Chapter V explores the tradeoffs between the policies and charts possible courses of action. The report itself focuses on policies to mitigate the short-term effects of oil supply disruptions. Appendix A discusses policies to reduce dependence on imported oil in the long term. Appendix B discusses allocation of crude oil to refineries during emergencies.

CHAPTER II. ECONOMIC EFFECTS OF PETROLEUM SHORTFALLS

While most public attention may be focused on gasoline lines, interruptions in oil supplies have major consequences for the entire economy and income distribution. A petroleum shortfall affects the economy in three interrelated ways:

- o By reducing output and employment;
- o By increasing inflation; and
- o By redirecting income flows.

REDUCED OUTPUT AND EMPLOYMENT

An oil shortfall lowers economic output and employment in two reinforcing ways. First, it reduces operations in manufacturing and other industries dependent on oil, thus lowering aggregate supply. Second, it reduces consumer demand. A shortfall and consequent oil price rise combine to transfer large amounts of real income from consumers to oil producers. This, in turn, reduces consumer purchases, which further depresses output and employment.

This type of economic loss has been witnessed in the past two oil disruptions. During the Arab oil embargo (the last quarter of 1973 and the first of 1974), world production dropped by over 4 million barrels per day, resulting in an 18 percent reduction in U.S. oil imports. The shortfall and its ensuing price increase combined with other shocks (worldwide crop failures, devaluation of the dollar, phaseout of wage and price controls) to turn what would have been a mild contraction into a deep recession. By the end of 1974, real Gross National Product (GNP) had declined at a 7.5 percent annual rate, and employment had fallen by approximately half a million persons, adding 0.5 percentage points to the unemployment rate. In response to the uncertainty created by the Iranian Revolution of 1979, increased stock demands doubled the price of oil and diverted it from other uses. The higher oil price resulted in substantially larger dollar outflows and increased inflation; this situation compelled the Federal Reserve Board to contract the money supply, forcing up interest rates. In response to these events, GNP growth fell from an annual rate of 1.2 percent in the first quarter of 1980 to minus 9.6 in the second. Thus, whether through their